The
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NOTES ON THE HISTORY OF BOTANY IN THE STATE OF WASHINGTON*

Field Work before 1860

The first stage of botanical work in the State was the collection of specimens, mainly of seed plants. The first period of this stage includes the work done before 1860, and comprises the work of sixteen botanists, most of whom accompanied exploring expeditions. Dr. Archibald Menzies was surgeon and naturalist with the Vancouver Expedition, 1790 to 1795. Merriweather Lewis of the Lewis and Clark Expedition collected botanical specimens on the return trip in 1806. David Douglas, a Scotch botanist, sent out by the London Horticultural Society, made extensive collections on two trips—1824 to 1827, and 1830 to 1833. Dr. John Scouler accompanied Douglas on his first expedition and collected specimens in 1825. Dr. Meredith Gairdner, a Hudson's Bay Company surgeon, collected a few specimens prior to 1840. Nathaniel Wyeth, an American traveler and trader, collected specimens in 1833. Thomas Nuttall, an American botanist of English birth, was a member of Wyeth's second expedition and collected specimens in 1834, '35, and '36. Dr. Charles Pickering and Mr. W. D. Brackenridge accompanied the Wilkes Exploring Expedition of 1841 as botanists. Charles A. Geyer, a German botanist, traversed the continent with a party of missionaries and collected specimens in 1843 and '44. Rev. Henry Spaulding, a missionary to the Nez Perce Indians, collected botanical specimens a few years later. Dr. David Lyall was surgeon and botanist with the International Boundary Survey and his botanical work in Washington was done from 1858 to 1860. John Jeffrey, a Scotch botanist sent by some patrons, collected seeds of plants of horticultural interest in 1851. Dr. J. G. Cooper was with the Stevens Survey of the forty-eighth parallel and did botanical work from 1853 to 1855.

*This article by Professor George B. Rigg and the accompanying article by H. K. Benson, Professor of Chemistry, are parts of the series now being published on the History of Science in the State of Washington. The previous articles in the series are as follows: Introductory article by the Editor and "Hydro-Electric Power in Washington" by Dean C. Edward Magnusson, in the issue for April, 1928; "History of Geology in the State of Washington," by Dean Henry Landes, in issue of October, 1928; "History of Fisheries in the State of Washington," by Dean John N. Cobb, January, 1929; "The Science of Bacteriology in the State of Washington," by Professor John Weinzirl; "History of Pharmacy in the State of Washington," by Dean C. W. Johnson, and "Home Economics in the State of Washington" by Professor Effie I. Raitt, April, 1929.—EDITOR.

The sets of plants collected by these workers are in various European and American herbaria and have been described by various botanists. A full account of the period is given in Piper's *Flora of the State of Washington.*

Field Work after 1860

The second period of this stage covers the time since 1860, and the workers were mainly residents of the region, though a few accompanied expeditions. Extensive collections were made in the state by Charles V. Piper from 1885 to 1903, the localities and dates being—Seattle. 1885-1892; Mount Rainier, 1888 and 1895; Olympic Mountains, 1890 and 1895; Union City, 1890; Pullman and vicinity, 1893-1903; Blue Mountains, 1896. His earlier specimens are in the herbarium at the Museum of the State University in Seattle, and his later ones in the herbarium of the State College at Pullman. A nearly complete set of his collections, including the types of his new species, is in the National Herbarium in Washington, D.C. He was an enthusiastic member of the Young Naturalists' Society during his student days at the University of Washington and other members of this society also made important collections. Among these collectors were Edmond S. Meany, Della M. Parker and Trevor Kincaid. A list of Professor Piper's publications on the flora of the State is given in connection with the account of the botany department at the State College at Pullman.

Mr. Thomas Howell devoted his years of painstaking work mainly to the plants of Oregon, but he also collected many plants in Washington. His herbarium is at the Oregon State University at Eugene. His work progressed slowly in the face of many discouragements and in 1903 he published his *Flora of Northwest America,* having set up the type and printed it himself. He died a few years ago.

Professor L. F. Henderson collected in the Olympic Mountains in 1890, and made extensive collections in various parts of the State in 1892 which were exhibited at the World's Columbian Exposition at Chicago in 1893. This collection is now in the herbarium at the Museum of the State University of Washington. He is now curator of the herbarium at the State University of Oregon.

Dr. Sereno Watson worked on the forests of Washington in 1890 in connection with the Tenth Census Survey. His specimens are in the Gray Herbarium at Harvard and he published a flora in

the *California Geological Survey* which includes some Washington plants.

Mr. W. N. Suksdorf, of Bingen, Washington, began collecting plants in the State in the early '80's and his collections have been extensive and important. Sets of his plants are in many herbaria and he has a large private collection.

A complete list of other collectors down to 1906 is given in Piper's *Flora of Washington.* Many collections of plants since 1906 have been made by persons connected with the botany departments at the State University, the State College, the State Normal Schools, and other schools and colleges. Mr. J. B. Flett, now of Charleston, Washington, has studied the flora of the State for many years and his *Features of the Flora of Mount Rainier National Park* has been published by the United States Department of the Interior. Among the other botanists who have collected specimens in the state are George R. Vasey, E. L. Greene, C. A. Ramm, F. Binns, E. C. Smith, Susan Tucker, J. M. Grant, E. R. Lake, Sandberg and Leiberg, O. D. Allen, A. D. E. Elmer, R. M. Horner, N. L. Gardner, W. M. Gorman, H. S. Conard, R. K. Beattie, A. A. Heller, F. H. Lamb, Kirk Whited, Thomas Bonser, T. C. Frye and Geo. B. Rigg.

The State College and Experiment Station

The first catalogue of the State College was issued in 1891 and shows Edward R. Lake as Professor of Horticulture, Forestry, and Botany. In 1893 Charles V. Piper came to the College as Professor of Botany and Zoology and continued in that capacity until 1903, when he went to Washington, D.C., in government work. He served as botanist in the Experiment Station during this time and part of the time as Entomologist also.

When Professor Piper left, Professor R. Kent Beattie, who had been a member of the department since 1900; became head, and continued until 1913, when he also went to Washington, D.C. in government work. He was succeeded by Professor H. B. Humphrey, who had been a member of the department since 1908 and had been professor of plant pathology from 1910 to 1913. In 1914 he followed his predecessors into government work in Washington, D.C., and Professor Ira D. Cardiff became Head of the Botany Department and Director of the Experiment Station. In 1918 he retired to go into business in connection with the fruit industry and was succeeded as Head of the Botany Department by Professor F. L.

Pickett, who has continued up to the present time. Professor Pickett's chief interest is in plant physiology and ecology. He has made studies of the life histories and adaptations of various plants of arid regions. Of special importance are the studies of the effect of complete desiccation upon protoplasm and certain plant structures. Reports of this work have been published in various botanical journals. J. G. Hall was professor of Plant Pathology in the Department in 1914.

H. T. Darlington was Professor of Taxonomy in the Department in 1914, and in 1921 Professor Harold St. John took up the work, continuing to the present time and serving also as Curator of the Herbarium. He has published descriptions of about two hundred new species of Washington plants. Professor J. E. Weaver was a member of the Department from 1912 to 1914 and did work on root systems and the ecology of crop plants. Among the others who have taught and done research work in the department are Professors G. H. Jensen and Hannah C. Aase. Dr. Aase's work has been in the field of special morphology and cytology. Since 1925 her research has had to do with the chromosome behavior of cereal hybrids, and has yielded results published in the *American Journal of Botany* and elsewhere. Dr. Jensen's work up to the time of his resignation in 1920 was primarily along lines of pharmaceutical botany and plant physiology.

In 1918 the Department of Plant Pathology was established, and Professor F. D. Heald, who had been Professor of Plant Pathology in the Botany Department since 1915, became its Head, continuing to the present time. Professor Heald's book, *A Manual of Plant Diseases,* was published in 1926 by the McGraw-Hill Book Company. He has made an intensive study of the economic fungi of Washington.

Much of the research work of the members of the botany staff has been published in bulletins of the State Experiment Station and in United States Government bulletins, and in professional Journals though several floras have been published. Piper's *Flora of the State of Washington* (1906) constitutes volume eleven of "Contributions from the United States National Herbarium." Piper and Beattie published the *Flora of the Palouse Region,* and later the *Flora of South Eastern Washington and Adjacent Idaho.* A second edition of the latter work was published in 1929, with Professor Harold St. John as co-author. Piper and Beattie's *The Flora of the Northwest Coast* was published in 1915.

The herbarium at the State College was begun by C. V. Piper. From its very beginning this herbarium was made the repository of many collections. Among those who have left duplicate collections here are L. F. Henderson, J. B. Flett, J. S. Cotton, W. N. Suksdorf, A. D. E. Elmer, R. M. Horner, Thomas Howell, F. O. Kreager, Kirk Whithead and F. H. Lamb. The herbarium also contains very full sets of the Washington collections of Geo. R. Vasey, Sandberg and Leiberg, M. W. Gorman, E. R. Lake and W. R. Hull, O. D. Allen, N. L. Gardner, A. A. Heller, H. C. Conard, H. T. Darlington, and R. Kent Beattie. Recently it has acquired the private collections of C. V. Piper, Wm. Cusick, and J. B. Anderson. Dr. Harold St. John was in charge of the herbarium from 1921 to 1929. His careful survey of the less known parts of the state and his full collections have within recent years added several thousand specimens to this collection. The herbarium now contains approximately 55,000 mounted and catalogued specimens of vascular plants. There are about 30,000 other specimens of vascular plants in unmounted collections and in collections available for research. In addition to the vascular plants the collection includes more than 2,000 specimens of mosses, aside from large private collections available for use by advanced students, and more than 10,000 specimens of fungi, largely parasitic forms. About ninety per cent of this collection is of northwestern and Pacific Coast specimens. It contains the material, including many type specimens, upon which the numerous publications of Piper, Beattie, Heald and St. John were based.

It has been the task of those interested in botanical work within recent years to bring together a workable library. At this time this library contains nearly fifteen hundred bound volumes in the general collection, and files of twenty-five leading botanical journals. A little while before his death Professor Piper arranged to have his private botanical library cared for, with his private collection of plants, by the State College. This collection of annotated books, reprints, and magazines, numbering more than two thousand items, is now a part of the botanical library.

Many important contributions to plant science have been made by the Washington State Experiment Station, and in this work the Botany, Chemistry, Zoology and other Departments have contributed so much that it is difficult to separate the contributions. The Station began in 1892 with four workers. In 1929 it has a staff of

fifty members and in new truth obtained and literature published it is increasingly uncovering the secrets of plant science.

Work that is scientifically and economically important has been accomplished in the experimental orchards. In agriculture important work has been done on wheat, oats, barley, corn and peas. Desirable strains of winter wheat have been introduced, and wheat hybrids which are strong in smut resistance and other desirable characters have been developed. Smut resisting varieties of oats have been introduced, and desirable varieties of corn, barley, and peas have been distributed.

Edwin C. Johnson is the present Director of the Station. Ira D. Cardiff preceded him, and R. W. Thatcher was Director from 1907 to 1913.

The Western Washington Experiment Station at Puyallup has given special attention to the problems of plant science in Western Washington. Among the important lines of contribution are kale selections, and the introduction and testing of new grains and lawn and pasture grasses, and the improvement of methods of control of diseases of lettuce, potatoes, and berries. J. W. Kalkus is the present Director and W. A. Linklater preceded him.

The State University

Botany became a separate Department in the University in 1900. H. R. Foster, who had been Head of the Biology Department, became Head of Botany and Trevor Kincaid, who had been Tutor and Laboratory Assistant in Biology, became Head of Zoology. T. C. Frye became Head of the Botany Department in 1903, Geo. B. Rigg became a member of the Department in 1909, and J. W. Hotson in 1911. These three constitute the staff at present.

The main lines of work carried on by the Staff are: Frye, morphology; Rigg, plant physiology; Hotson, mycology. Professor Frye has done extensive research on mosses, liverworts, algae, and other lines of botany. Rigg's research has been largely on Sphagnum bogs, but he has also done work on kelps, the physiology of evergreenness, and the botanical phases of forestry. Hotson's research has been mainly on the fungi, though during the war he worked on Sphagnum moss as a material for surgical dressings. The research papers from the department have been published in various botanical and biological journals and in United States government publications. Besides the general and special courses functioning in liberal

education and in the training of botanists, service courses are given for forestry, pharmacy and fisheries.

The following books have been published by the members of the staff, either alone or in collaboration with other workers: Frye and Engstrom, *A Key to the Families of Washington Plants,* University of Washington, 1908; Frye and Rigg, *Laboratory Exercises in Elementary Botany,* Ginn and Company, 1911; Frye and Rigg, *Northwest Flora,* University Book Store, 1912; Frye and Rigg, *Elementary Flora of the Northwest,* American Book Company, 1913; Frye and Jackson, *The Ferns of Washington,* reprinted from the *American Fern Journal,* 1914; Clark and Frye, *The Liverworts of Washington,* separate of the *Publications of the Puget Sound Biological Station,* 1929; Rigg, *The Pharmacists' Botany,* the Macmillan Company, 1924.

Frye was employed in United Soil surveys in Western Washington in 1910 and 1911. The work was published by the United States Bureau of Soils. Frye and Rigg were employed as scientists in the United States Bureau of Soils in the investigations of kelps as a source of potash. In 1913 Frye was in charge of an expedition on the southern Alaska coast and Rigg was in charge of an expedition on the western Alaska coast. Rigg also made surveys of the kelps of the Puget Sound region in 1911 and 1912. The reports of these expeditions were published in Senate Document 199, Sixty-second Congress, Second Session (1911), and in Report No. 100, United States Department of Agriculture (1915). Papers by Rigg, growing out of this work were also published in the *Plant World* (1912), *Science* (1914) and the *Journal of Industrial and Engineering Chemistry* (1915), and one by Frye, Rigg and Crandall in *The Botanical Gazette,* 1915. During the summer of 1921, Rigg was in charge of a biological survey of the Skykomish and Snoqualmie Rivers and their tributaries and adjacent lakes for the State Department of Fisheries.

Hotson was employed in work on fire blight in the orchards in the Yakima Valley during the summers of 1914 and 1915. He published a series of articles on this disease in *Phytopathology* 1915 to 1920. He was employed in United States Government work on a survey of cereal diseases in Eastern Washington in 1919 and on a survey of the white pine blister rust in Western Washington in 1922, and papers in *Publications Puget Sound Biological Station* and other journals followed. In 1912 he published a revision of the genus Papulospora in the *Proceedings of the American Academy of Arts*

and Sciences, and two later papers on the same subject in the *American Journal of Botany* and the *Botanical Gazette.* During the war he was supervisor of Sphagnum Dressings for the Northwest Division of the Red Cross and published papers through the Red Cross and in *Publications of the Puget Sound Biological Station,* the *Journal of the American Peat Society* and *Science.*

The herbarium at the University contains about 33,000 specimens. About 18,000 of these are Washington plants, about 4,500 are foreign, and the remainder are from various parts of the United States. Among the more notable collections in the herbarium are the C. V. Piper collection from the State of Washington, the L. F. Henderson collection of Washington plants prepared for the World's Columbian Exposition at Chicago (1893), the T. C. Frye collection of mosses from Washington, Alaska, and British Columbia, the G. L. Wittrock collection from Iowa and other parts of the United States, the Heimerl collection from Austria, the F. H. Burgelhaus collection from Minnesota and Wyoming, the E. C. Townsend collection from North Carolina, and W. J. Eyerdam collection from Hayti.

The herbarium was begun in 1880 by the collections of the Young Naturalists Society, and passed into the custody of the Botany Department when it was established. It was given into the charge of the State Museum of the University in 1914. F. S. Hall was Director of the Museum from 1909 to 1929, and Mrs. Martha Flahaut was assistant in charge of the herbarium. G. L. Wittrock was Museum Botanist in 1928 and 1929.

Biological Station

The Puget Sound Biological Station of the University of Washington is located at Friday Harbor on San Juan Island in the San Juan Archipelago. The site comprises 485 acres, considerable of which is coniferous forest, and has about a mile of marine shore line. There are at present ten buildings. Four of them are laboratories for classes, one is a research laboratory, one contains stock rooms, one consists of the dining room, kitchen and library, while the other two are residences—one for the Director and one for the Curator. Courses in biology are given in a nine weeks session in the summer, and opportunities for research are offered during the entire summer. The Curator is in residence throughout the year and arrangement can be made for carrying on research at any time. One course in botany and one in zoology are given by the Bellingham Normal School at the Station each summer.

The other courses are given by specialists from the University of Washington, and other institutions in various parts of the United States. Frequently a specialist from some foreign university also gives a course. The marine flora and fauna of the region are unusually rich in number of species and in number and size of individuals and many research workers are attracted to the Station by the unusual opportunities offered. The Station grounds and other places in the islands offer excellent opportunities for ecological and taxonomic work in both botany and zoology.

The growth of the work at the Station has been a gradual one, and did not begin at the present location. O. B. Johnson, professor of Natural History at the University of Washington began marine biological work at Rocky Point on Bainbridge Island in 1889. The Young Naturalists Club had a steamer dredging in the Sound in 1895 with O. B. Johnson, Trevor Kincaid, Charles V. Piper, Edmond S. Meany and Professor Starks of Stanford participating in the work. Members of the society dredged again in 1896 in Mats Mats Bay near Port Townsend.

The Regents of the University of Washington authorized the establishment of a Biological Station in 1902 and Trevor Kincaid, Professor of Zoology, and H. R. Foster, Professor of Botany were to decide the location. They examined the region between Port Townsend and Bellingham, dredging from a row boat and tramping the shores at low tide. Professor Foster left the University in 1903 and was succeeded by Professor T. C. Frye. Professor Kincaid did some work at Friday Harbor that summer, securing a room in a store building as headquarters for the work, and hiring a man to take him out in a row boat.

In 1904 instruction was begun by Professors Kincaid and Frye, though no formal courses were offered. A small building near Friday Harbor, belonging to Captain Warbass was rented for headquarters and dredging was done from a gasoline launch, the dredge being handled with a windlass worked by hand.

Courses have been given every summer beginning with 1906 and research has also been carried on. From 1906 to 1908 the work was carried on in an abandoned salmon cannery in Friday Harbor, and a shrimp steamer or a gasoline launch was used in dredging. In 1909 the work was done in co-operation with the Washington State College, part of the session being at Friday Harbor and part at Olga on Orcas Island.

In 1910 Captain Andrew Newhall of Friday Harbor gave four

acres of land near the town for the station and two buildings were erected, one containing general laboratories and research rooms, and the other containing a dining room and a kitchen. In 1913 a botanical laboratory was constructed in the space under the front part of the dining room and the main laboratory building was used for zoology.

A Marine Biological Preserve was created by the State of Washington in 1923, including all of the marine waters of San Juan County and some contiguous territory, to insure the perpetuation of an abundant fauna and flora in the region of the station.

The present site at Point Caution on the opposite side of the town from the old station was secured by deed from the United States Government, and buildings were erected and the station work transferred to the new site in 1924. Professor Kincaid was Director from 1910 to 1913, and Professor Frye has been Director from 1914 to the present time.

A library of several hundred volumes has been built up, and a trained librarian, Dr. Lena A. Hartge, is in charge of the library during the summer. Current subscriptions to the leading American and many foreign biological journals are carried and the back numbers for the last few years are on file. In 1915 the journal, *Publications Puget Sound Biological Station,* was established. The numbers are published from time to time as the material is ready. The journal is now in its seventh volume.

Some Publications not Included Above

Professor Le Roy Abrams of Stanford University is preparing a three-volume work, *The Flora of the Pacific Coast States.* It is published by Stanford University, and one volume has already appeared. The trees of the state are described in Sudworth's *Forest Trees of the Pacific Slope* and Sargent's *Sylva of North America. Our Greatest Mountain,* by F. W. Schmoe, describes the flowers, ferns and trees of Mount Rainier, and Dr. Edith S. Clements' *Flowers of Coast and Sierra* describes a good many Washington flowers. *Forests of Mount Rainier* by G. F. Allen was issued in 1916 by the Department of the Interior.

Botany in the State of Washington, beginning with the work of merely collecting, describing and classifying specimens, has become a science of vast complexity, contributing to pure science in many lines and functioning through service courses and research work in

its taxonomic, morphological, cytological, physiological, ecological and pathological phases in the development of horticulture, agriculture, pharmacy, forestry and fisheries.

GEORGE B. RIGG.